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FILE

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of:	)	
	)	
Redevelopment of Spectrum to	)	
Encourage Innovation in the Use	)	ET Docket No. 92-9
of New Telecommunications	)	
Technologies	)	

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Reply Comments of Motorola Inc.

Motorola Inc. (hereinafter Motorola) submits the following reply comments in the above captioned Notice of Proposed Rulemaking.

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I. SUMMARY

Commission spectrum and regulatory decisions in this and related proceedings will determine which technologies and services will be available in the U.S. and what will happen to the domestic telecommunications manufacturing industry. In short, the present Commission will be remembered for its role in determining whether or not the United States industry remains a leader in wireless communications in the future and whether businesses have access to the communications systems required to stay competitive in a global economy. The vast breadth and quantity of comments to the Emerging Technology proposal underscores its important role in determining the future of wireless communications in the U.S.

The real issues surrounding relocation of incumbent microwave users to higher bands are cost, and regulatory modifications, not reliability. As shown in the comments to this proceeding, both propagation calculations and actual practice confirm that spectrum at 6 GHz can provide fixed system reliability equal to or even better than that at 2 GHz, without intermediate repeaters or larger antennas. While the details need to be further defined, the Commission's proposed compensation plan should adequately address the cost issue. Finally, specific regulatory changes to modify eligibility requirements and channeling plans in the existing 6 GHz private and common carrier bands already proposed by the microwave community should provide sufficient spectrum to reaccommodate 2 GHz systems with adequate capacity for future growth as well.

The comments of PCS proponents and even some incumbent microwave users support the Commission's proposal to relocate 2 GHz fixed systems to other bands with the cost of relocation paid for by new entrants. The few commenters that paint sharing between microwave and PCS as a total solution ignore some elements of the family of PCS services as well as long term capacity requirements. Implementation and growth of Emerging Technologies such as PCS will be stymied if the Commission relies on sharing as the total solution and fails to make adequate provisions to relocate fixed microwave systems to alternative bands.

As an added incentive, the Commission should set aside a portion of the Emerging Technology spectrum for dedicated non-carrier licensed private PCS systems and provide incumbent microwave licensees first rights for licensing in that band segment. Motorola also recommends that portions of the Emerging Technology bands to be used for mobile satellite be consistent with worldwide MSS WARC-92 allocations and be reserved for spectrally efficient low earth orbit systems.

II. 6 GHz IS A RELIABLE MICROWAVE BAND

In its comments, Motorola provided propagation calculations comparing the predicted system outage at 2 and 6 GHz for fixed point-to-point paths of 24, 39 and 6 miles, respectively. These calculations show

no significant difference in reliability at 2 and 6 GHz, even with the same size dish antenna. [1]

One commenter, Associated PCN Company (APCN), suggested to the contrary that a larger antenna will be needed at 6 GHz to maintain equivalent reliability and that the cost of such an antenna makes relocation an unattractive solution. [2] APCN commissioned a study by Telecommunications Design Services, Inc., (TDSI) which concluded that the cost of relocation would be substantial and that the technical characteristics and rules governing the alternate bands for relocation made such a move extremely difficult, inefficient or not feasible. According to TDSI, a significant factor in the cost calculations is the need to use larger antennas and intermediate repeater sites when relocating from 2 to 6 GHz.

The TDSI study shows an additional 10 db path loss in moving from the 2 GHz to the 6 GHz band and concludes a larger antenna is needed at 6 GHz to offset this loss. While the 10 db additional loss is correct, the assumption this loss requires a larger antenna is not. A 2 GHz 8 foot diameter antenna has a 31.1 dBi gain while a 6 GHz 8 foot diameter

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[1] In its comparison, Motorola assumed an eight foot dish for both 2 and 6 GHz.

[2] APCN has applied for a pioneer preference based on claims that its system design allows for at least two PCS providers in an urban area without relocating fixed microwave users.

antenna has a 42.0 dBi gain, for a net improvement of approximately 11 dB. This more than offsets the 10 dB path loss difference between 2 and 6 GHz.

The example shown in Exhibit B of APCN's comments illustrates a move from 2 GHz to 6 Ghz for a 60 mile path. To compensate for the path loss, the 10 foot antenna at 2 GHz was replaced by a 12 foot antenna at 6 GHz. This configuration actually resulted in an improvement of some 7 dB in the fade margin when moving from 2 GHz to 6 GHz. Notably, even for this long 60 mile path, no intermediate repeater was needed, even though APCN generally concluded that such repeaters would be required when relocating long paths from 2 to 6 GHz.

The TDSI study implies that the antenna heights may have to be greater at 6 GHz to achieve Fresnel zone clearance. In fact, however, it may be possible to achieve such clearance by lowering the antenna height at 6 GHz as compared to that at 2 GHz, with a corresponding decrease in wind loading.

Motorola does concur that the higher efficiency antennas at 6 GHz, even though the same diameter as 2 GHz, may increase wind loading if maintained at the same height. However, in many situations, the antennas are mounted on buildings or on towers that can handle the additional loading without modification. Even for the worst case in which additional tower support is required as a direct result of relocating from 2 to 6 GHz, the associated cost could be included in the compensation negotiation between microwave users and PCS licensees.

APCN also indicates that the move to 6 GHz would result in inefficient spectrum utilization because channels at 6 GHz are wider than those at 2 GHz. The microwave community, however, has already proposed rule modifications for the 6 GHz private and common carrier bands to allow a better match with users' requirements. Alcatel Networks Systems, Inc. and others in the industry have made specific rechannelization proposals to address this issue.

Other comments in the proceeding provide real world indications that alternative bands provide reliable alternatives for relocating current 2 GHz point-to-point systems. In its comments, the City of San Diego supports the Commission's market based reaccommodation proposal and indicates the City is already negotiating with a potential PCS licensee to relocate its 2 GHz microwave systems. Baltimore Gas and Electric (BG&E), also a 2 GHz licensee, supports relocation of microwave systems to provide spectrum for Emerging Technologies such as PCS:

> Moreover, we believe that many existing fixed microwave users will have little technical difficulty in moving to other bands or alternative wireline systems, such as fiber optics. BG&E anticipates that emerging technologies such as PCS will lead to significant future utility applications, and provide a new source of reliable voice and data communications during emergency situations.[3]

[3] BG&E comments at page 3.

In its comments, American Personal Communications cites significant examples of reliable microwave systems currently operating at 6 GHz or higher, including several leading utilities and the Federal Aviation Administration.

Some microwave users have also questioned the available capacity at 6 GHz to accommodate future growth as well as systems relocated from 2 GHz. It is Motorola's understanding that significant capacity is available in the 6 GHz common carrier band as AT&T, a principle licensee in the band, continues to convert microwave paths to fiber. In fact, AT&T has proposed rechannelizing the 6 GHz common carrier band to accommodate private microwave user needs. Modifying eligibility requirements to open this band to private microwave users on a routine basis, therefore, should resolve any concerns of sufficient capacity for future microwave growth.

Given the reliability and available capacity at 6 GHz, it appears the only remaining issues surrounding reaccommodation involve Commission rule modifications concerning eligibility, channelization, and loading standards and specific provisions for compensation by new entrants. As noted in our comments, specific rule modifications have been proposed by the microwave community and the Commission should move swiftly to address these recommendations.

In addition, Motorola supports full compensation for the legitimate cost of relocating microwave users to alternative bands. The wide variety

of cost estimates provided by various commenters underscores the utility of leaving specific compensation negotiations to the market. Therefore, only minimal Commission involvement should be necessary in this process. The Commission should, however, address up front a mechanism forresolution of unwarranted holdout situations to ensure that reasonable opportunities exist to bring the benefits of emerging technologies such as PCS to fruition in the U.S. a timely manner.

III. Sharing Versus Clear Spectrum Though Relocation

The majority of commenters agreed that sharing was at best only a short term or "get started" strategy for emerging technologies such as PCS, and that clear spectrum is required for PCS to develop fully. Even in the short term, Motorola's experimental operations show that sharing is practical only for certain PCS services, such as those offering islands of coverage rather than wide area operation.

A few commenters indicate spread spectrum access techniques would obviate the need for microwave relocation. However, as noted by NYNEX in its comments, such technologies have not been proven to allow permanent non-interfering co-existence in the 2 GHz range. Motorola's own tests under its experimental PCS license in the Chicago area indicates that reliance on broadband spread spectrum overlay techniques is likely to result in interference to microwave users.

Those commenters (e.g. Millicom, Inc., Associated PCS, and Spatial, Inc.) that supported sharing and indicated that relocation was unnecessary, failed to consider "all" PCS services as well as the long term capacity needs of PCS systems. For example, Associated PCN suggested that two carriers were sufficient and limited its offering to pedestrian PCS. No consideration was given for wide area dedicated private or carrier operated mobile systems or for non-licensed data and voice systems.

Further, suggesting that "on-the-average" there is 50 MHz to 100 MHz of spectrum available on a shared basis in all urban areas is misleading. It fails to point out that there is little or no spectrum available in some specific areas and that these areas may in fact coincide with high density pedestrian or mobile islands or corridors leaving much of the market under- or un-served. By analogy, it is entirely possible for a statistician to drown in a river that "on-the-average" is only 2 feet deep.

IV. PRIVATE PCS

A number of commenters, while agreeing with the FCC's proposal in general, also emphasized the importance of an allocation for dedicated private wide area PCS systems to accommodate emerging technologies beneficial to U.S. industrial productivity. Emerging data and video technologies will be available to support a number of industrial productivity and public safety communications applications which reach

beyond the wireless phone services envisioned to be offered by PCS carriers. A number of these applications were described in Motorola's comments to this proceeding.

In its comments, the Associated Builders and Contractors support the assignment of spectrum to emerging technologies such as dedicated, customized private PCS systems and recommends against allocating spectrum only for carrier provided PCS. The American Road and Transportation Builders Association recommends adequate spectrum be provided for the private radio user and in particular the road/land transportation contractor and the ancillary services that support their efforts.

EDS Corporation which is responsible for the worldwide communications and information processing requirements of General Motors, also urged the Commission to consider the service needs of "purely private" non-carrier users:

> In the past, the availability of frequencies for licensing on a private, non-commercial basis has provided businesses the flexibility to use their radio systems in innovative ways to meet their unique needs. In many major markets today, however, all available spectrum for private systems already is occupied. For private businesses to continue to innovate in the future, the Commission must take their needs into consideration when allocating spectrum in the bands the Commission is considering for emerging new technologies.

Just as today, no one system will meet all users' needs in the future. Though total flexibility may be attractive from a regulatory standpoint, the basic structure of separate allocations for both carrier and dedicated private system requirements used in the past has contributed significantly to the success of mobile telecommunication and the increased productivity of its users in the U.S. Motorola believes such an allocations structure is absolutely essential to provide the nation's businesses with cost effective best-fit communications solutions, today and in the future. Without a dedicated spectrum segment for private wide area licensed systems, many of the industrial productivity gains and public safety improvements which could be realized from PCS service will be lost.

V. EMERGING MOBILE SATELLITE SYSTEMS

In their comments, Comsat and AMSC supported additional mobile satellite allocations within the 1850-2200 MHz Emerging Technology bands. Motorola recommends that such allocations be consistent with worldwide MSS allocations made at WARC-92. Furthermore, any Emerging Technology mobile satellite allocations should be reserved for low earth orbit (LEO) systems, because the demand will be for spectrally efficient MSS service directly to small hand-held personal subscriber units. LEO satellite systems can meet this demand much better than geostationary systems.

The Commission's Emerging Technology proposal at para. 28 states:

> Generally, we are of the view that, at a minimum, requests for operation of new services in these bands should demonstrate that the service makes innovative use of a new technology and that the technology is most appropriately suited to operate on in the 2 GHz region. Similarly, requests for expansion of existing services should demonstrate that the expansion would offer some substantial improvement in either quality of service or spectrum efficiency. Such improvements would generally be provided through use of new technology.

Old technology geostationary satellite systems do not appear to meet these requirements and, therefore, may not even be qualified to access spectrum in these bands.

VI. Availability of the 1710-1850 MHz Federal Government Band

The vast majority of the commenters supported accelerated negotiations between the Commission and NTIA to make the 1710-1850 MHz band available for commercial use. NTIA in its comments indicated it expects a preliminary report on the possibility of sharing some spectrum in the 1710-1850 MHz band by the first week in August and will share this

information with the Commission. Hopefully, sufficient information will be made available to assess further the possibility of employing this band for emerging mobile technologies and if needed, to supplement the other fixed relocation bands currently under consideration.

MOTOROLA INC.

CERTIFICATE OF SERVICE

I, Kelle Gardner, of Motorola Inc., do hereby certify that on this 8th day of July, 1992, a copy of the foregoing Comments was sent to each of the following by first class mail, except where hand delivery is noted (*):

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